

CLAIMS

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1. A method of inducing cell death comprising the step of contacting a cell with an amount of isolated *Flavivirus* or *Pestivirus* capsid protein, or a functional fragment thereof, effective to induce cell death; or introducing into said cell a nucleic acid molecule comprising a nucleotide sequence encoding a *Flavivirus* or *Pestivirus* capsid protein, or a functional fragment thereof, said nucleic acid being free from an entire *Flavivirus* or *Pestivirus* virus genome, wherein said nucleotide sequence is expressed in said cell at a level effective to induce cell death.
2. The method of claim 1, wherein the isolated capsid protein, or functional fragment thereof, or the nucleic acid molecule is from a virus selected from the Japanese encephalitis virus group subgenus.
3. The method of claim 1, wherein the isolated capsid protein, or functional fragment thereof, or the nucleic acid molecule is from West Nile virus (WNV).
4. The method of claim 3, wherein the functional fragment comprises SEQ ID NO:8.
5. The method of claim 3, wherein the nucleic acid molecule encodes SEQ ID NO:8.
6. The method of claim 1, wherein the cell is a tumor cell.
7. The method of claim 1, wherein the cell is contacted with the *Flavivirus* or *Pestivirus* capsid protein, or a functional fragment thereof.
8. The method of claim 1, wherein the nucleic acid molecule is introduced into said cell.
9. A method of identifying compounds that inhibit *Flavivirus* or *Pestivirus* capsid protein, or a functional fragment thereof, from inducing apoptosis in cells comprising the steps of

- a) contacting the cells, in the presence of a test compound, with an amount of *Flavivirus* or *Pestivirus* capsid protein, or a functional fragment thereof, sufficient to induce a detectable level of apoptosis in the cells; and
- b) comparing the level of apoptosis detected in step (a) with the level of apoptosis that occurs when cells are contacted with *Flavivirus* or *Pestivirus* capsid protein, or a functional fragment thereof, in the absence of said test compound.

10. The method of claim 9, wherein the cells are contacted with *Flavivirus* or *Pestivirus* capsid protein.

11. The method of claim 9, wherein the cells are contacted with a functional fragment of *Flavivirus* or *Pestivirus* capsid protein.

12. The method of claim 11, wherein the functional fragment comprises SEQ ID NO:8.

13. The method of claim 9, wherein the cells are selected from the group consisting of Hela cells, RD cells, and 293 cells.

14. The method of claim 9, wherein the detecting step is an assay that detects a marker of apoptosis.

15. The method of claim 14, wherein the marker is phosphatidylserine (PS) or free 3'-hydroxy DNA termini.

16. The method of claim 15, wherein the assay is TUNEL analysis or annexin V flow cytometry.

17. A kit for performing the method of claim 9 comprising

- a) a container comprising *Flavivirus* or *Pestivirus* capsid protein, or functional fragment thereof; and

- b) at least one additional component selected from the group consisting of: instructions, positive controls, negative controls, photos depicting data, and figures depicting data.

18. An injectable pharmaceutical composition comprising

- a) a *Flavivirus* or *Pestivirus* capsid protein, or a functional fragment thereof, or a nucleic acid molecule that comprises a nucleotide sequence that encodes a *Flavivirus* or *Pestivirus* capsid protein or a functional fragment thereof; and
- b) a pharmaceutically acceptable carrier.

19. The injectable pharmaceutical composition of claim 18 comprising

- a) a nucleic acid molecule that comprises a nucleotide sequence that encodes a *Flavivirus* or *Pestivirus* capsid protein or a functional fragment thereof; and
- b) a pharmaceutically acceptable carrier.

20. The injectable pharmaceutical composition of claim 18 comprising

- a) a *Flavivirus* or *Pestivirus* capsid protein, or a functional fragment thereof; and
- b) a pharmaceutically acceptable carrier.

21. The injectable pharmaceutical composition of claim 18 comprising

- a) a WNV capsid protein, or a functional fragment thereof; and
- b) a pharmaceutically acceptable carrier.

22. A method of treating an individual diagnosed with or suspected of suffering from a disease characterized by hyperproliferating cells which comprises the step of administering to said individual an effective amount of the injectable pharmaceutical composition of claim 18.

23. A method of treating an individual diagnosed with or suspected of suffering from a disease characterized by hyperproliferating cells which comprises the step of administering to said individual an effective amount of the injectable pharmaceutical composition of claim 19.

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24. A method of treating an individual diagnosed with or suspected of suffering from a disease characterized by hyperproliferating cells which comprises the step of administering to said individual an effective amount of the injectable pharmaceutical composition of claim 20.

25. A method of treating an individual diagnosed with or suspected of suffering from a disease characterized by undesirable cells comprising eliminating the undesirable cells by administering to said individual an effective amount of the injectable pharmaceutical composition of claim 18.

26. The method of claim 24, wherein the capsid protein, or functional fragment thereof, is WNV capsid protein, or functional fragment thereof.

27. The method of claim 22, wherein the disease is cancer.

28. The method of claim 22, wherein the administration step is accomplished by intra-tumoral injection of the injectable pharmaceutical composition.

29. A method of identifying an individual exposed to *Flavivirus* or *Pestivirus* comprising the steps of:

- contacting antibodies specific for *Flavivirus* or *Pestivirus* capsid protein with a sample from the individual; and
- detecting whether said antibodies are bound to *Flavivirus* or *Pestivirus* capsid protein from the sample,

wherein detection of binding of the antibodies to *Flavivirus* or *Pestivirus* capsid protein is indicative of exposure of the individual to *Flavivirus* or *Pestivirus*.

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30. The method of claim 24, wherein the capsid protein is WNV capsid protein.

31. A kit for identifying individuals exposed to a *Flavivirus* or *Pestivirus* comprising

- a) a first container comprising antibodies specific for a *Flavivirus* or *Pestivirus* capsid protein; and
- b) a second container comprising *Flavivirus* or *Pestivirus* capsid protein, or a fragment thereof.

32. ~~The kit of claim 31, wherein the first container comprises antibodies specific for WNV capsid protein and the second container comprises WNV capsid protein, or a fragment thereof.~~

33. A method of identifying an individual exposed to a *Flavivirus* or *Pestivirus* comprising the steps of:

- a) contacting a sample with *Flavivirus* or *Pestivirus* capsid protein; and
- b) detecting whether said *Flavivirus* or *Pestivirus* capsid protein is bound to antibodies in said sample,

wherein detection of binding of *Flavivirus* or *Pestivirus* capsid protein is indicative of exposure of the individual to *Flavivirus* or *Pestivirus*.

34. ~~The method of claim 33, wherein the virus is WNV and the capsid protein is WNV capsid protein.~~

35. A kit for identifying individuals exposed to a *Flavivirus* or *Pestivirus* comprising

- a) a first container comprising *Flavivirus* or *Pestivirus* capsid protein; and
- b) a second container which contains antibodies which specifically bind to *Flavivirus* or *Pestivirus* capsid protein.

36. ~~The kit of claim 35, wherein the capsid protein is WNV capsid protein.~~

37. A vaccine composition comprising

- a) an immunologically effective amount of *Flavivirus* or *Pestivirus* capsid protein, or an immunogenic fragment thereof; and
- b) a pharmaceutically acceptable carrier.

38. The vaccine of claim 37, wherein the *Flavivirus* or *Pestivirus* capsid protein, or immunogenic fragment thereof, is WNV capsid protein, or immunogenic fragment thereof.

39. A vaccine composition comprising
a) nucleic acid encoding *Flavivirus* or *Pestivirus* capsid protein, or an immunogenic fragment thereof; and
b) a pharmaceutically acceptable carrier.

40. The vaccine of claim 39, wherein the nucleic acid encodes WNV capsid protein, or an immunogenic fragment thereof.

41. A method of treating an individual exposed to a *Flavivirus* or *Pestivirus* by administering a therapeutically effective amount of capsid protein, or an immunogenic fragment thereof, from a *Flavivirus* or *Pestivirus*, or a nucleic acid encoding capsid protein, or an immunogenic fragment thereof, from a *Flavivirus* or *Pestivirus*.

42. The method of claim 41, wherein the virus to which the individual is exposed is WNV, and wherein the capsid protein, or fragment thereof, or the nucleic acid encoding the capsid protein, or immunogenic fragment thereof, is from WNV.

43. A method of protecting an individual from *Flavivirus* or *Pestivirus* infection by administering a prophylactically effective amount of capsid protein, or an immunogenic fragment thereof, from a *Flavivirus* or *Pestivirus*, or a nucleic acid encoding capsid protein, or an immunogenic fragment thereof, from a *Flavivirus* or *Pestivirus*.

44. The method of claim 43, wherein the virus against which the individual is to be protected is WNV, and wherein the capsid protein, or fragment thereof, or the nucleic acid encoding the capsid protein, or immunogenic fragment thereof, is from WNV.

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